Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Exam Date: June 25/26

Exam Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exam Length: 2 hours

# MPM2D Exam Review

As the end of semester two swiftly approaches, preparation for the Grade 10 Academic math examination is of vital importance. The following is a recommended guideline for studying and preparing for this final exam:

1. FINAL REVIEW HANDOUT: Complete the exam review provided.

2. TESTS and QUIZZES: Study the questions on all previous tests and quizzes.

Reattempt any questions you answered incorrectly.

If you cannot answer a question, seek out any help

available. ( eg. see your teacher, parents, friends, etc.)

3. GROUP STUDY SESSIONS: It may be helpful to plan group study sessions with your friends. Choose a specific theme

(ie. Quadratic Relations), and bring quizzes and tests along to discuss/do particular questions.

HINT: This is most helpful if the group is NOT too large, and remains focused on the areas of concern.

Remember that planning and preparation is the key to success.

DO NOT WAIT UNTIL THE LAST MINUTE TO STUDY.

Your exam will focus on KNOWLEDGE/UNDERSTANDING type questions and some shorter APPLICATION questions (3 or 4 step).

\*\*\*\* Don’t forget to bring a SCIENTIFIC CALCULATOR, a RULER and your TEXT BOOK to the exam.

GOOD LUCK STUDYING !

**Chapter 1/Unit 1**

1. Define two variables and write a linear equation or system of equations that models the given situations below:
   1. The total value of dimes and nickels is $1.75.
   2. A number is four times another number. Six times the smaller number plus half the larger number is 212.
   3. Joan invested $1200 in an RRSP. She invested part in a technology fund that pays 15% per year and the remainder in bonds that pay 5% per year. She earned $160 in interest for the year.
2. Is the ordered pair (18, 1) a solution to the following linear system?

*x* – 6*y* = 12

**

1. Solve the system of equations graphically: *y* = -2*x* + 8

3*x* – 4*y* = 12

1. Without solving, indicate the number of solutions the system of equations have. Explain why the systems have the determined number of solutions.

|  |  |
| --- | --- |
| a. 2*x* + *y* =12  6*x* + 3*y* = 36 | b. 24*x* – 6*y* = 36  8*y* – 64*x* – 16 = 0 |

1. Solve the system of equations using substitution:

|  |  |
| --- | --- |
|  | b. 2*x* + 3*y* – 9 = 0  *x* – *y* – 2 = 0 |
|  |  |

1. Solve the system of equations using elimination:

|  |  |
| --- | --- |
| a. 2*x* – 7*y* = 11  *x* – *y* = -2 | b. 3(*x* - 1) – 2(*y* - 2) = 0  *x* + 3*y* = -4 |

1. Bart’s cell phone package costs $15 per month and an additional $0.10 per minute. Zoe pays $10 per month and $0.12 per minute. Determine a linear system that could be used to find when their monthly bills would be the same. Calculate the point at which both cell phone packages are equal.

**Chapter 2/Unit 2**

1. Three hospitals are located at these given points: Civic Hospital (-8.9, 11.7), General Hospital (6.2, 9.4) and Riverside Hospital (3.5, -4.2). Which two hospitals are closest to each other? All distances are in kilometers.
2. Find the midpoint of a line with endpoints A(3,5) and B(7,-3).
3. Determine the coordinates of the points that divide a line with end points X(-10,-16) and Y(2,24) into four equal parts. How could you verify your solution?
4. The equation of a circle is given by .

a) State the radius and the centre of the circle.

b) The point (*k*, -4) is on the circle. Determine the value(s) of *k*.

1. Determine the equation of a circle with centre (0, 0) and diameter 18m.
2. Is the point (3, -5) inside, on, or outside the circle *x*2 + *y*2 = 36?
3. Triangle ABC has vertices A(1,1), B(4,5) and C(9,-5). Show that it is a scalene right triangle.
4. Given triangle ABC where A(-1, 2), B(3, 8) and C(5, 1), find the equation of the altitude from B.
5. Quadrilateral PQRS has vertices P(2,3), Q(8,5), R(11,-4) and S(5,-6).
   1. Show that the diagonals bisect each other.
   2. Show that quadrilateral PQRS is a rectangle.
6. A new light standard is required for a parking lot. The new light is to be located at L(6,14). The closest power cable to the new light standard runs in a straight line containing points A(0,4) and B(12,10). Explain how to determine at what point “C” the lighting contractors should connect the new lighting cable to the main power cable. Determine how much cable they will require. Each unit represents 1m.
7. A straight path is to be built between points D(-35,32) and B(29,-16), where the units represent meters.
   1. How long is the path?
   2. A bench is to be placed halfway along the path. Find the coordinates of the point at which the bench will be placed.
8. A fish catching a small insect on the surface of a still pond causes a circular ripple. The radius of the circle increases at a constant rate of 4cm/s.
   1. Write an equation that describes the ripple exactly 5s after the fish catches the insect.
   2. How long does it take for the ripple to reach the edge of a rock that is 1m east and 0.75m north (100,75) of the point where the fish caught the insect?

**Chapter 3/ Unit 3**

1. What is the degree of the following relations?

a)  b)  c)  d) 

1. Which relations in the question above have graphs that are parabolas?
2. Use first and second differences to determine which type of relationship best models the given table of values.

a.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* | 5 | 6 | 7 | 8 | 9 |
| *y* | 25 | 36 | 49 | 64 | 81 |

b.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* | 1 | 2 | 3 | 4 | 5 |
| *y* | 2 | 7 | 12 | 17 | 22 |

1. For the parabola shown on the right state:

a) axis of symmetry

b) vertex

c) max/min value

d) zeros

e) *y*-intercept

1. Determine the equation of the graph in the previous question, in factored form.
2. Find the coordinates of the vertex of the relation *y* = -3(*x* - 7)(*x* + 3)
3. For , determine:

a) the *x*-intercepts

b) the *y*-intercept

c) the equation of the axis of symmetry

d) the vertex

e) the direction of opening

1. Sketch the graph of 
2. Determine the quadratic equation for a parabola with zeros at - 8 and -2, and passing through

the point ( -4, 12).

1. Expand and simplify:

|  |  |
| --- | --- |
| a. (5*a* + 7)(2*a* – 6)  c. (*t* – 4)2 | b. –(*x* – 4)(5*x* + 10)  d. –3*x*(*x* + 2) |

1. a) Determine the equation, in factored form and standard form of the quadratic curve of best

fit for the data:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* | -5 | -3 | -1 | 1 | 3 |
| *y* | 4.8 | 0 | -2.4 | -2.4 | 0 |

b) use one of your equations to estimate the *y*-value when *x* = -7.

1. The following table shows a quadratic relationship.

 a) Create a scatter plot of the data and draw a curve of best fit.

b) Estimate the coordinates of the vertex and the zeros

c) Determine the equation, in factored form, that models the relationship between

the height and time.

1. The Pie Club bakes pies and sells them to raise money for charity. Their annual profit is modeled by the quadratic relation , where *x* represents the number of pies sold in hundreds and P represents their annual profit in hundreds of dollars. What is the company’s maximum profit?

**Chapter 4/Unit 4**

1. Factor each of the following expressions.

|  |  |
| --- | --- |
| a. | b. |
| c. | d. |
| e.  g. | f.  h. |

1. Factor each of the following quadratic relations:

|  |  |
| --- | --- |
| a. *y* = *x*2 + 7*x* + 12 | b. *y* = 3*x*2 – 16*x* + 5 |
| c. *y* = 2*t*2 –12*t* – 32 | d. *y* = 144*x*2 – 169 |
| e. *y* = 25*x*2 + 20*x* + 4 | f. *y* = 3*x*2 – 9*x* |

1. Without graphing, state the zeroes of:

|  |  |
| --- | --- |
| a. *y* = *x*2 + 8*x* +15 | b. |
|  |  |

1. A golf ball is hit and its height is given by *h* = 29.4*t* – 4.9*t*2, where *h* is its height in meters and *t* is the time in seconds. When does the golf ball hit the ground?
2. The height of a tossed stone relative to time is described by the relation

*y* = -2*x*2 + 10*x*, where *x* is the time in seconds after the stone is tossed and *y* is the stone’s height in meters.

a) For how many seconds is the stone in the air?

b) What is the maximum height of the stone?

c) How high is the stone after 3s?

1. The formula for the daily profit at the Kanata Wave Pool is *P* = -4*x*2 + 120*x* – 500 where *P* is the profit, in dollars, and *x* is the admission price, in dollars.

a) What price should they charge to break even?

b) What price should they charge to maximize daily profit?

c) What is the maximum daily profit?

**Chapter 5/Unit 5**

1. a) Fill in the characteristics of the following quadratic relation.

b) Describe the transformations that were applied to the graph of *y* = *x*2 to arrive at the

given equations.

c) Sketch a graph of each relation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Quadratic Equation** | **Vertex** | **Axis of symmetry** | **Max/Min**  **Value** | **Max or Min?** | **Opens**  **up/down** | **y-intercept** |
|  |  |  |  |  |  |  |
| *y* = -8(*x* – 2)2 |  |  |  |  |  |  |
| *y =* 6*x*2- 4 |  |  |  |  |  |  |

1. List the transformations applied to the graph of to produce the graph that can be modeled by .
2. Find the equation of the parabola:

a) with vertex (-1, 7), that has been reflected in the *x*-axis and vertically stretched by a

factor of 2.

b) that has been vertically stretched by a factor of and translated 6 units right and 4 units down.

1. Express  in standard form.
2. Express each relation in vertex form then state the vertex. State the max/min value and indicate whether it is a maximum or a minimum

. a. *y* = -6*x*2 + 60*x* – 23 b. *y* = 5*x*2 + 10*x* –11

c. *y* = 10*x*2 - 60*x*

1. The cost, in dollars, of operating a machine per day is given by the formula

*C* = 3*t*2 – 96*t* + 1014, where *t* is the time the machine operates, in hours. What is the minimum cost of running the machine? For how many hours must the machine run to reach this minimum cost?

**Chapter 6/Unit 6**

1. Solve using the most appropriate method.

|  |  |
| --- | --- |
| a. *x*2 – *x* – 30 = 0  c. 6(*x* – 1)2 = 54  e. | b. 3*x*2 – 39*x* = -126  d. -1.3*x*2 + 0.5*x* + 2.3 = 0 |
|  |  |

1. Solve when *y* = 2, to one decimal place.
2. Find the zeros of .
3. The path of a ball thrown in the air is modeled by the given equation. *H* = -4*t*2 + 72*t* +2,

where *H* is the height in meters and *t* is time elapsed in seconds. For what length of time was

the ball above 10 m?

1. Diana dove from the 10m diving board. Her height, in metres, above the water when she is *x* metres away from the end of the board is given by *h* = -(*x* – 1)2 + 11. What horizontal distance had she traveled when she entered the water? Answer to the nearest tenth of a metre.
2. A ball is thrown upwards from a cliff. It’s height above the ground, *h*, in metres, is modeled by the relation , where *t* is the time in seconds.

a) How high is the cliff?

b) How high is the ball above the ground after 2s?

c) When does the ball reach its maximum height?

d) What is the maximum height?

e) When does the ball hit the ground?

f) When is the ball 30m above the ground?

**Chapter 7/Unit 7**

1. Prove the two triangles are similar and make a statement of similarity. Then determine the length of CD and CE.

. 

1. A radio tower casts a shadow 35.2 m long. At the same time, a 1.4 m boy casts a shadow

4.8 m long. How high is the radio tower?

1. Calculate the value of *x*.

*x*

42 m

28 m

a) b)

*x*

4

8

1. a) Determine the three primary trigonometric ratios for angle ϑ. Do not use decimals.

ϑ

24

25

b) Determine the measure of angle ϑ.

1. A ski hill has an angle of depression of 50°. According to the map, the horizontal distance from the top of the hill to the bottom is 1.3km.
   1. How high is the hill?
   2. How long is the ski run?
2. Two helicopters flying at the same altitude spot a boat in distress in the water below. The helicopters are 1.2km apart, their altitude is 1000m and the angles of depression to the boat are 52° and 42°. The Coast Guard is trying to determine which helicopter to send to respond to the distress call. Which helicopter should fly to the boat to rescue its passengers?
3. Find the measure of the angle that is formed between the line and the *x*-axis.

**Chapter 8/Unit 8**

1. Solve each of the following triangles.

70°

6.5 cm

74°

N

M

L

1. b)

30°

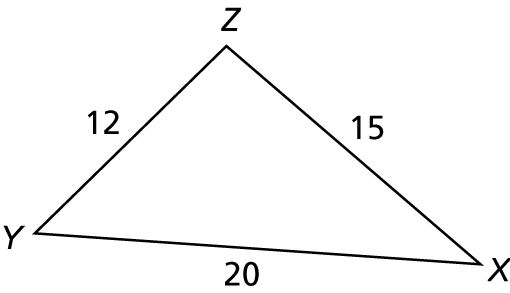
110.5°

94.0 m

Z

Y

X



c) d)

63°

8.4 cm

47°

F

D

E

1. Kelly delivers milk to grocery stores in three towns in a remote area. The roads connecting the towns form a triangular route. The first section of the route is 32.8km. The third section is 28.2km. The angle between the first section and the third section is 46°. How long is the second section of the route?
2. A wooden border is to built around a triangular flower garden that has sides 10 m, 7 m, and

8 m. What is the smallest angle formed by the border inside the flower garden?

1. The bases on a baseball diamond are 30m apart. A player picks up a fair ground ball 3m from third base along the line from second to third base. How far must he throw it to first base, assuming the baseball diamond is a square?
2. Jan and Paul are on opposite sides of a tree standing 80 feet apart. Jan looks up at the tree at an angle of elevation of 30°. Paul looks up at the tree at an angle of elevation of 25°. How tall is the tree?

**MPM 2D Exam Review Answers**

**Ch. 1:**

**1.** (a) 0.1d+0.05n=1.75 (b) 4x=y, 6x+1/2b=212 (c) x+y=1200, 0.15x+0.05y=160 **2.** Yes **3.** (4,0) **4.** (a) infinite because same lines (b) one because not parallel **5.** (a) (-3/4, -4) (b) (3,1) **6.** (a) (-5,-3) (b) (-1,-1) **7.**  250 min.

**Ch. 2:**

**8.** General Hospital & Riverside are closest **9.** (5,1) **10.** (-4,4) (-7,-6) (-1,14) **11.** (a) centre: (0,0) r=5 (b) ±3 **12.** x2+y2=81 **13.** Inside **14.** AC≠BC≠CA scalene **15.** y=6x-10 **16.** (a)M(PR) = M(QS) (b) PQ=QS, QR=SP, angles= 90˚ **17.** 6.3m **18.** (a) 80m (b) (-3,8) **19.** (a) x2+y2=400 (b) 31.25 sec

**Ch. 3:**

**20.** (a) 2 (b) 1 (c) 2 (d) 3 **21.** a, c **22.** (a) quadratic (b) linear **23.** (a) x=2 (b) (2,1) (c) max value=1 (d) (1,0) (3,0)

(e) (0,-3) **24.** y=-(x-1)(x-3) **25.** (2,75) **26.** (a) (0,0) (8,0) (b) (0,0) (c) x=4 (d) (4,64) (e) down **27.**  Sketch

**28.** y=-3/2(x+8)(x+2) **29.** (a) 10a2-16a-42 (b) -5x2+10x+40 (c) t2-8t+16 (d) -3x2-6x **30.** (a) y=0.3(x+3)(x-3) y=0.3x2-27 (b) y=12 **31.** (a) graph (b) z: (1,0) (6,0) V: (3.5,16) (c) y=-64/25(x-1)(x-6) **32.**  $7225

**Ch. 4:**

**33.** (a) (x-7)(x+3) (b) 9x(x-3) (c) (2x-3y)(x+y) (d) 3(x+5)(x+6) (e) (x-11)(x+11) (f) 2(x2-5y)(x2+5y) (g) x(x+5)2 (h) (2x+1)(6y-2) **34.** (a) y=(x+4)(x+3) (b) y=(3x-1)(x-5) (c) y=2(t-8)(t+2) (d) y=(12x-13)(12x+13) (e) y=(5x+2)2

(f) y=3x(x-3) **35.** (a) (-5,0)(-3,0) (b) (-2,0)(5/3,0) **36.** 6 sec **37.** (a) 5 sec (b) 12.5m (c) 12m **38.** (a) $5 or $25 (b) $15 (c) $400

**Ch. 5:**

**39.** (a)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Quadratic Equation** | **Vertex** | **Axis of symmetry** | **Max/Min**  **Value** | **Max or Min?** | **Opens**  **up/down** | **y-intercept** |
| (i) | (-3,8) | x=-3 | y=8 | Min | Up | (0,25/2) |
| *(ii) y* = -8(*x* – 2)2 | (2,0) | x=2 | y=0 | Max | Down | (0, -32) |
| *(iii) y =* 6*x*2- 4 | (0,-4) | x=0 | y=-4 | Min | Up | (0,-4) |

(b) (i)V. stretch bafo ½, H. translated left 3 units, V. translated up 8 units (ii)reflected in x-axis, V. stretch bafo 8, H. translated right 2 units (iii) V. stretch bafo 6, V. translated down 4 units (c) graphs

**40.** y=-3(x-4)2+65: reflected in x-axis, V. stretch bafo 3, H. translated right 4 units, V. translated up 65 units. **41.** (a) y=-2(x+1)2+7 (b) y=1/3(x-6)2-4 **42.** y=-3x2+30x-63 **43.** (a) y=-6(x-5)2+127 V: (5,127) Max value: 127 (b) y=5(x+1)2-16 V: (-1,-16) min value: 16 (c) y=10(x-3)2-90 V☹3,-90) min value: -90 **44.** min cost: $246 at 16 hours

**Ch. 6:**

**45.** (a) -5 & 6 (b) 6 & 7 (c) -2 & 4 (d) -1.15 & 1.53 (e) -5 & 8/3 **46.** 0.5 & 2.9 **47.** -1 & 7 **48.** 17.8 sec. **49.** 4.32 m **50.** (a) 20m (b) 30m (c) 1.5 sec (d) 31.25m (e) 4 sec (f) 1 & 2 sec

**Ch. 7:**

**51.** <ACB=<ECD (opposite angles), <ABC=<EDC (alternate angles, Z-pat) (AA similarity), CD=15/7 cm, CE=12/7 cm **52.** 10.3m **53.** (a) 8.9 (b) 31.3 m **54.** (a) sinθ=7/25 cosθ=24/25 tanθ=7/24 (b) θ=16˚ **55.** (a) 1.5 km (b) 2.0 km **56.** The helicopter with angle of depression 52˚. **57.** 63˚

**Ch. 8:**

**58.**  (a) <X=39.5˚, z=50.2m, x=63.8m (b)<M=36˚, m=4.1cm, l=6.6cm (c) <D=70˚, e=6.5cm, f=8.0cm (d) <Y=48˚, <X=37˚, <Z=95˚ **59.** 24.2 km **60.** 46˚ **61.** 40 m **62.** 21 ft

**Graphs:**

**3.**  **27.  31. **

**Exam Formula Sheet**

Midpoint: 

Distance: 

Circle: 

Parabolas: 





Quadratic Formula: 

Primary Trigonometry Ratios: SOH, CAH, TOA

Sine Law:  OR 

Cosine Law: 